

The background of the page features a large, faint, circular seal of the State of South Dakota. The seal has a serrated outer edge. Inside the circle, the words "STATE OF SOUTH DAKOTA" are written in a semi-circle at the top, and "1889" is at the bottom. A banner across the middle reads "UNDER GOD THE PEOPLE RULE". The central image of the seal depicts a landscape with a river, a windmill, and rolling hills.

# **STATEMENT OF BASIS**

## **Minor Air Quality Permit Renewal**

**Avera McKennan Hospital  
&  
University Health Center**

**Sioux Falls, South Dakota**

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## 1.0 Background

On May 24, 2012, Avera McKennan in Sioux Falls, South Dakota, submitted a renewal application for its current minor air quality permit #28.0807-01 for the operation of three emergency generators. The primary Source Industrial Code for this facility is 8062 – General Medical and Surgical Hospitals.

The current permit includes enforceable operating restrictions on the emergency generators in order to limit sulfur dioxide and nitrogen dioxide emissions below the major source threshold for the Title V air quality permit program. The proposed changes will be reviewed to ensure the potential emissions are still below the major source threshold.

### 1.1 Existing Equipment

Table #1-1 is a list of permitted equipment from the existing minor air quality permit issued December 23, 2009:

*Table #1-1 -Description of Permitted Units, Operation, and Processes*

Unit	Description	Maximum Operating Rate	Control Device
#1	2007 Caterpillar, Model #3516B, EPA Tier 1 stationary. The generator is fueled with distillate oil.	2,250 kilowatts	Not applicable
#2	2007 Caterpillar, Model #3516B, EPA Tier 1 stationary. The generator is fueled with distillate oil.	2,250 kilowatts	Not applicable
#3	2009 Caterpillar, Model #C32, 480V heavy duty packaged generator set. The generator is fueled with distillate oil.	1,120 kilowatts	Not applicable

The application notes the 2009 Caterpillar generator has a maximum operating rate of 1,502 horsepower, which is equivalent to 1,000 kilowatts based on the information submitted with the 2009 application. Therefore, the description and review will be updated to 1,000 kilowatts.

## 2.0 New Source Performance Standards

DENR reviewed the federal new source performance standards (NSPS) in 40 CFR Part 60 and determined that the following may be applicable.

### 2.1 ARSD 74:36:07:88 – 40 CFR Part 60, Subpart IIII

DENR review of the NSPS determined 40 CFR Part 60, Subpart IIII may be applicable. Subpart IIII is applicable to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that:

1. Commence construction after July 11, 2005 where the stationary CI ICE are manufactured after April 1, 2006 and are not fire pump engines; or

2. Modify or reconstruct their stationary CI ICE after July 11, 2005.

This rule was finalized July 11, 2006, and is applicable to each stationary compression ignition internal combustion engine that commenced construction, modification, or reconstruction after July 11, 2005. Avera McKennan's generators #1, #2, and #3 were all constructed after July 11, 2005. Therefore, the generators #1, #2, and #3 are all applicable to this new source performance standard.

Generators #1 and #2 were ordered and manufactured in 2007. Generators #1 and #2 have a maximum capacity of 2,250 kilowatts and have a displacement of approximately 4 liters per cylinder. In accordance with 40 CFR § 60.4205(b), owners and operators of 2007 model year and later emergency generators with a displacement of less than 30 liters per cylinder must comply with the emission standards in 40 CFR § 60.4202. In accordance with 40 CFR § 60.4202(b)(1), owners and operators of model years 2007 through 2010 with a displacement less than 10 liters per cylinder and with a maximum capacity greater than 2,237 kilowatts must meet the standards in Table 1 of the subpart. Table 1 of the subpart lists the following for emission limits:

Hydrocarbons – 1.3 grams per kilowatt-hour  
Nitrogen oxides – 9.2 grams per kilowatt-hour  
Carbon monoxide – 11.4 grams per kilowatt-hour  
Particulate matter – 0.54 grams per kilowatt-hour

Generator #3 was ordered and manufactured in 2009. Generator #3 has a maximum capacity of 1,000 kilowatts and has a displacement of approximately 3 liters per cylinder. In accordance with 40 CFR § 60.4205(b), owners and operators of 2007 model year and later emergency generators with a displacement of less than 30 liters per cylinder must comply with the emission standards in 40 CFR § 60.4202. In accordance with 40 CFR § 60.4202(a)(2), owners and operators of model years 2007 and later with a displacement less than 10 liters per cylinder and with a maximum capacity less than 2,237 kilowatts and greater than 37 kilowatts must meet the standards in 40 CFR § 89.112 and 89.113. 40 CFR § 89.112 and 89.113 lists the following for emission limits:

Non-methane hydrocarbons and nitrogen oxides – 6.4 grams per kilowatt-hour  
Carbon monoxide – 3.5 grams per kilowatt-hour  
Particulate matter – 0.20 grams per kilowatt-hour

## **2.2 ARSD 74:36:07 – 40 CFR Part 60, Subpart JJJJ**

DENR review of the NSPS determined 40 CFR Part 60, Subpart JJJJ may be applicable. For the purposes of this subpart, the date construction commences is the date the engine is ordered by the owner or operator. Subpart JJJJ is applicable to owners and operators of stationary spark ignition (SI) internal combustion engines (ICE) that commence construction after June 12, 2006, where the stationary SI ICE are manufactured:

1. On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 horsepower (except lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower);

2. On or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower;
3. On or after July 1, 2008, for engines with a maximum engine power less than 500 horsepower;
4. On or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 kilowatts (25 horsepower); or
5. Owners and operators of stationary SI ICE that commence modification or reconstruction after June 12, 2006.

These generators were constructed after June 12, 2006. However, the generators are fueled with diesel fuel and are not considered a spark ignition engine. Therefore, these generators are not applicable to this subpart.

### **3.0 New Source Review (NSR)**

ARSD 74:36:10:01 states that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. Avera McKennan, located in Sioux Falls, SD, is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, Avera McKennan is not subject to NSR review.

### **4.0 Prevention of Significant Deterioration**

Any stationary source which emits or has the potential to emit 250 tons per year or more of any air pollutant is considered a major source and is subject to prevention of significant deterioration (PSD) requirements (ARSD 74:36:09 – 40 CFR. Part 52.21(b)(1)). Any stationary source which emits or has the potential to emit 100 tons per year or more of any air pollutant and is one of the 28 named PSD source categories is subject to PSD requirements (ARSD 74:36:09 – 40 CFR. Part 52.21(b)(1)). The following is a list of regulated pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate matter with a diameter less than or equal to 10 microns (PM10);
3. Particulate matter with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO<sub>2</sub>);
5. Nitrogen oxides (NO<sub>x</sub>);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Greenhouse gases (carbon dioxide, nitrous oxide, methane, etc.)
10. Fluorides;
11. Sulfuric acid mist;
12. Hydrogen sulfide;
13. Reduced sulfur compounds; and
14. Total reduced sulfur.

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air

pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

According to the Clean Air Act, once a pollutant is regulated under any part of the Act, (as was the case with greenhouse gas emissions after the motor vehicle regulations were finalized in March 2010) major new sources or major modifications are subject to the PSD program and Title V air quality operating permit program. Under the Clean Air Act, PSD and Title V air quality operating permits are required for all sources that emit a regulated air pollutant above 100 or 250 tons per year, depending on the source. This threshold, if applied to greenhouse gases, would greatly increase the number of facilities requiring a PSD review or Title V air quality operating permit. Based on administrative necessity, EPA increased these thresholds through the “Tailoring Rule.”

On May 13, 2010, EPA issued the final version of the “Tailoring Rule” for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;
2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and
5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

#### **4.1 Potential Emissions**

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA’s Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant’s application, or other methods to determine potential air emissions.

Potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application and assuming the unit operates 500 hours per year, while using the fuel that will emit the greatest emissions. Potential emissions are not realistic of the actual emissions and are used only to identify which air quality permit and requirements Avera McKennan is required to meet.

##### ***4.1.1 Potential Emissions – Generator***

The facility indicated it had three emergency generators on-site. The generators produce emissions from the burning of distillate oil as a fuel source.

Table 4-1 displays the sulfur dioxide emission factor as derived from the Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1, Chapter 3, Section 3.4-1. The particulate matter, nitrogen oxide, carbon monoxide and volatile organic compound emission factors were derived from the New Source Performance Standard Subpart IIII requirements.

**Table 4-1 – Fuel Emissions Factor for Generators**

	PM <sub>10</sub>	SO <sub>2</sub> <sup>1</sup>	NO <sub>x</sub>	CO	VOC
<b>Diesel Fuel – Engine (lb/MMBtu)</b>	-	0.0015	-	-	0.1
<b>Diesel Fuel – Engine #1 &amp; #2 (grams/kilowatt)</b>	0.54	-	9.2	11.4	1.3
<b>Diesel Fuel – Engine #1 &amp; #2 (pounds/kilowatt)</b>	0.0012	-	0.0203	0.0251	0.0029
<b>Diesel Fuel – Engine #3 (grams/kilowatt)</b>	0.2	-	6.4	3.5	-
<b>Diesel Fuel – Engine #3 (pounds/kilowatt)</b>	0.0004	-	0.0141	0.0077	-

1 – Sulfur oxide emissions are a function of the sulfur content in the fuel (1.01 x Sulfur Content). The New Source Performance Standard Subpart IIII requires the generator to be fueled with ultra low sulfur fuel 0.0015% sulfur by weight.

The application lists the generators-capacity in kilowatts (kw). DENR converted this unit's output rating to an estimated heat input rating based on the conversion factors of 3,413 Btus per hour per kilowatt, and 1,000,000 Btus per MMBtus and the generator efficiency in equation 4-1. The results of the conversions are shown in Table 4-2 below. DENR assumes generators of this size and age have an operational efficiency of 35%.

**Equation 4-1– Generator Conversion**

$$\text{Potential} \left[ \frac{\text{tons}}{\text{year}} \right] = \text{Output} [kw] \times 3,413 \left[ \frac{\text{Btus}}{\text{kilowatt}} \right] \div 1,000,000 \left[ \frac{\text{Btus}}{\text{MMBtus}} \right] \div \text{efficiency}$$

**Table 4-2 – Engine Specifications**

Unit	Capacity (kw)	Efficiency	Estimated Heat Input Capacity (MMBtu/hr)
<b>#1 – Generator 1</b>	2,250	35.0%	22
<b>#2 – Generator 2</b>	2,250	35.0%	22
<b>#3 – Generator 3</b>	1,000	35.0%	11

The application states that the generator is used for emergency use only. Therefore, emergency generators' potential emissions will be based on the unit operating 500 hours per year instead of operating 8,760 hours per year.

Equation 4-2 calculates the generators' potential emissions of each pollutant based on the capacities (heat input), the listed emission factor, and 500 operating hours per year.

**Equation 4-2– Generator Potential Emissions**

$$\text{Potential} \left[ \frac{\text{tons}}{\text{year}} \right] = \frac{\text{input capacity} \left[ \frac{\text{MMBtu or kw}}{\text{hour}} \right] \times \text{emission factor} \left[ \frac{\text{lbs}}{\text{MMBtu or kw}} \right] \times 8,760 \left[ \frac{\text{hours}}{\text{year}} \right]}{2,000 \left[ \frac{\text{lbs}}{\text{ton}} \right]}$$

Using Equation 4-2, DENR calculated the potential emissions for the generators. The results are shown in Table 4-3.

**Table 4-3 - Potential Uncontrolled Emissions from Generators (tons/year)**

Unit	PM10	SO <sub>2</sub>	NO <sub>x</sub>	CO	TOC
#1 – Generator #1	0.7	0.0	11.4	14.1	1.6
#2 – Generator #2	0.7	0.0	11.4	14.1	1.6
#3 – Generator #3	0.1	0.0	3.5	1.9	0.3
<b>Total</b>	2	0	26	30	4

Avera McKennan does not meet the 250 tons per year threshold and is not one of the 28 named PSD source categories. Therefore, Avera McKennan is considered a minor source under the PSD program and is not subject to PSD requirements.

The current operating permit contains short term limits for nitrogen oxide, an hourly limit on the generators, an annual limit for nitrogen oxides, and a clause exemption the generators from the requirement to meet the PSD program. Since the three emergency generators have to meet the requirements under the federal standards for generators (Subpart IIII), these additional limits and associated record keeping are no longer required for the facility to maintain its minor source status under the PSD program. Therefore, these conditions will not be included in the renewed permit.

#### **4.1.2 Potential to Emit for Greenhouse Gases**

The next step is to determine if Avera McKennan has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more. The six regulated greenhouse gases are the following:

1. Carbon dioxide;
2. Nitrous oxide;
3. Methane;
4. Hydrofluorocarbons;
5. Perfluorocarbons; and
6. Sulfur hexafluoride.

The greenhouse gas emission factors for firing the units with distillate oil are from AP-42 Tables 1.3-3, 1.3-8, 1.3-12 and are listed below:

1. Carbon dioxide = 22,300 pounds per 1,000 gallons;
2. Nitrous oxide = 0.26 pounds per 1,000 gallons;
3. Methane = 0.22 pounds per 1,000 gallons.

#### **Equation 4-3– Annual distillate oil for each unit**

$$Potential \left( \frac{\text{gallons}}{\text{yr}} \right) = \text{MaximumHeatInput} \frac{\text{MMBtus}}{\text{hour}} \times 500 \frac{\text{hours}}{\text{year}} \div 0.14 \frac{\text{MMBtus}}{\text{gallon}}$$

Using Equation 4-4, the appropriate emission factors and operating rates were used to determine the potential greenhouse gas emissions. In the case of the greenhouse gases, the result of



Equation 4-4 needs to be multiplied by 1, 310, and 21 for carbon dioxide, nitrous oxide, and methane, respectively, to convert the results to carbon dioxide equivalent. The potential emissions for the greenhouse gases are summarized in Table 4-4.

**Equation 4-4 – Potential emissions**

$$Potential \left( \frac{\text{tons}}{\text{yr}} \right) = Annual \text{ Fuel} \left( \frac{\text{gallons}}{\text{year}} \right) \times Factor \left( \frac{\text{lbs}}{1,000 \text{ gallons}} \right) \div 2,000 \frac{\text{lbs}}{\text{ton}}$$

**Table 4-4 –Greenhouse Gas Potential Emissions (tons per year)**

Description	Capacity (MMBtu/hr)	Carbon Dioxide	Nitrous Oxide	Methane	Carbon Dioxide Equivalent
#1 – Generator #1	22	876	0.01	0.01	879
#2 – Generator #2	22	876	0.01	0.01	879
#3 – Generator #3	11	438	0.01	0.00	441
<b>Total</b>					2,199

Avera McKennan is considered an existing non-PSD source with the potential to emit less than 100,000 tons per year of carbon dioxide equivalent emissions. Therefore, Avera McKennan is considered a minor source for greenhouse gases under the PSD program. Avera McKennan is not applicable to the PSD program for greenhouse gases.

## 5.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed the national emission standards for hazardous standards and determined the proposed amendment to the minor air quality permit is not applicable to any standards under 40 CFR Part 61.

## 6.0 Maximum Achievable Control Technology Standards

### 6.1 Potential HAP Emissions

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA’s Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant’s application, or other methods to determine potential air emissions.

### **6.1.1 Potential HAP Emissions – Generators**

The potential for generators to emit HAPs can be calculated using the same assumptions outlined in 4.1.1. The emission factor for diesel engines for HAPs with maximum operating rates greater than 600 horsepower is 0.0043 pounds per million Btus. The total potential emissions can be calculated using Equation 4-4. The results for the generators are listed in Table 6-1.

**Table 6-1 – Potential HAPs Emissions for Generators (tons/year)**

<b>Unit</b>	<b>HAPs</b>
<b>#1 – Generator #1</b>	0.02
<b>#2 – Generator #2</b>	0.02
<b>#3 – Generator #3</b>	0.01
<b>Total</b>	0

Based on Table 6-1, Avera McKennan is not considered an area source of HAP's.

## **6.2 MACT Standards**

DENR reviewed the Maximum Achievable Control Technology (MACT) standards under 40 CFR Part 63 and determined the following need to be reviewed further to determine if they are applicable.

### **6.2.1 40 CFR Part 63 Subpart ZZZZ**

In accordance with 40 CFR Part 63 Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) an affected source is any existing, new, or reconstructed stationary reciprocating internal combustion engines located at a major or area source of hazardous air pollutant emissions, excluding stationary reciprocating internal combustion engines being tested at a stationary reciprocating internal combustion engines test cell/stand (40 CFR § 63.6590).

The generators were constructed after June 12, 2006, and are located at an area source. Under section 40 CFR § 63.6590 (c) it states that a new or reconstructed stationary engine located at an area source must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part. Therefore, the generator is subject to Subpart ZZZZ, and must meet requirements of this subpart by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines.

## **7.0 State Requirements**

Any source operating in South Dakota that meets the requirements of the Administrative Rules of South Dakota (ARSD) 74:36:05:03 is required to obtain a Title V air quality permit. Avera McKennan's particulate matter, sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) and volatile organic compound (VOC) emissions are less than 100 tons per year, carbon dioxide equivalent (CO<sub>2</sub>) emissions are less than 100,000 tons per year and hazardous air pollutant emissions are less than 10 tons per year for a single hazardous air pollutant and 25 tons

per year of a combination of hazardous air pollutant. Based on the emission estimates, Avera McKennan is considered a minor source. Even a minor source may require a Title V permit if it is applicable to a New Source Performance Standard or a National Emission Standard for Hazardous Air Pollutants (MACT). Avera McKennan is applicable to the NSPS standard Subpart IIII and MACT standard Subpart ZZZZ. However, as noted in Administrative Rules of South Dakota (ARSD) 74:36:07:88 and 40 CFR § 63.6585 (d), an area source (minor) is not required to obtain a Title V permit if the only reason for the Title V permit is the requirement of Subpart IIII and/or Subpart ZZZZ. Therefore, Avera McKennan does not require a Title V permit because it is applicable to a federal standard.

Any source operating in South Dakota that meets the definition of a minor source under the (ARSD) 74:36:01:01(37) is required to obtain a minor air quality permit. Therefore, Avera McKennan is required to obtain a minor air quality permit.

## 7.1 State Particulate Emission Limits

ARSD 74:36:06 establish state emission limits for total suspended particulate matter and sulfur dioxide that is required to be permitted. Since Avera McKennan does require a permit, the state's total suspended particulate matter and sulfur dioxide limits do apply.

Regardless if a permit is required, ARSD 74:36:12:01 establishes a visible emission limit of 20 percent opacity for each unit.

Total suspended particulate and sulfur dioxide emission limits are applicable to fuel burning units. The proposed generator is a fuel burning unit. The total suspended particulate and sulfur dioxide emission limit for a fuel burning unit is derived from ARSD 74:36:06:02.

Equation #7-1, derived from ARSD 74:36:06:02(1)(b), is used to calculate the state's total suspended particulate emission limit for fuel burning units.

### *Equation #7-1 – State Total Suspended Particulate Emission Limit*

$$E_{TSP} \left[ \frac{lbs}{MMBtu} \right] = 0.811 \times H^{-0.131}$$

Where H is the heat input capacity, in units of million Btus per hour.

Use equation 7-1 for Unit #1 and #2 from 74:36:06:02(1) for units with an input capacity greater than 10 million Btus per hour.

Table 7-1 shows the total suspended particulate emission limit for unit #1, #2, and #3.

**Table 7-1 – Total State Suspended Particulate Emission Limit**

Unit	Heat Input Capacity	Emission Limit
#1 – Generator #1	22 million Btus per hour	0.5 pounds per million Btus
#2 – Generator #2	22 million Btus per hour	0.5 pounds per million Btus
#3 – Generator #3	11 million Btus per hour	0.6 pounds per million Btus

ARSD 74:36:06:02(2), the sulfur dioxide emission limit for a fuel burning unit is shown in Table 7-2.

***Table 7-2 Sulfur Dioxide Emission Limit***

<b>Unit</b>	<b>State Emission Limit</b>
#1-- Generator #1	3.0 pounds per million Btus
#2 – Generator #2	3.0 pounds per million Btus
#3 – Generator #3	3.0 pounds per million Btus

## **7.2 Compliance Assurance Monitoring**

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V air quality permit. Avera McKennan is not applying for a Title V air quality permit, therefore this is not applicable.

## **7.3 Periodic Monitoring**

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to the Title V air quality operating permit program. Since Avera McKennan is applying for a minor quality air permit, this is not applicable.

## **8.0 Recommendation**

Based on the above findings, Avera McKennan is not required to obtain a Title V air quality permit, but is required to obtain a minor air quality permit. Generators #1, #2, and #3 are subject to 40 CFR Part 63, Subpart ZZZZ and 40 CFR Part 60, Subpart IIII and must meet those requirements. The department recommends approval of a minor air quality permit with operational limits for Avera McKennan.

Based on information DENR received in the permit application, Avera McKennan is considered an area source that does require a minor air quality permit. Questions regarding this permit review should be directed to Ashley Brakke, Engineer I.